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### **Paper No. 32: Multi-Skilled, Self- Managing Work Teams in a Zone Construction Environment**

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# Multi-Skilled, Self-Managing Work Teams in a Zone Construction Environment No. 32

Daniel J. Stravinski, Visitor, National Steel and Shipbuilding Co., San Diego, CA

## **MULTI-SKILLED, SELF-MANAGING WORK TEAMS IN A ZONE-CONSTRUCTION ENVIRONMENT**

### **ABSTRACT**

This report will document National Steel and Shipbuilding Company's (NASSCO's) efforts to develop self-managing, multi-skilled work teams. The objective of this effort was to develop and test a new production work force organization corresponding to the technical requirements of product-oriented work breakdown structure, otherwise known as zone construction. NASSCO was awarded a grant from the Human Resource Innovation Panel (SP5) of the SNAME Ship Production Committee in order to explore the benefits of this type of work force organization.

### **BACKGROUND**

NASSCO is a marine construction facility employing between 5,000 to 7,000 during peak periods. NASSCO is considered to be a total marine facility with capabilities in design, engineering, new construction, conversion, repair, and offshore oil drilling platforms.

The hourly work force is represented by seven (7) different craft unions. NASSCO's hourly personnel during this project fluctuated from high of approximately 4,100 to a low of 2,800.

Labor-management relations had gone through a very stormy period in 1980 when a ship launching was disrupted by employees angered over the suspension of a shop steward. Twenty-eight employees were discharged, three of whom were subsequently sent to jail for their part in a plot to bomb the Company. 1981 contract negotiations resulted in a three-week strike which was eventually settled based on a modified economic offer by the Company.

With this activity as background, the Company began an attempt to involve employees in decisions that affected them, by implementing a quality circle process in March, 1981. This effort expanded to include 40 quality circle groups involving over 400 employees at its peak. Although union leaders were invited to informational meetings at the start of the quality circle process, and to periodic quality circle conferences sponsored by the Company thereafter, union involvement in the process was limited to union shop stewards and officials who were active members of the individual quality circles.

Prior to 1984 contract negotiations, a number of meetings were held with local union representatives to explain the need for the Company to become more competitive if it was to survive. The Company had embarked on an effort to bring new shipbuilding technologies to the yard and these technologies dictated a different approach to organizing the work and the workers who performed it.

In order to bring the point home, local union leaders accompanied managers of NASSCO to Japan to view for themselves the efficiencies inherent in the new shipbuilding technologies, as well as how the Japanese conducted small group activities with their work force.

1984 negotiations produced a new labor agreement that allowed some sharing of work between the two largest unions in the yard, as well as new classifications suited to perform work in a zone-construction environment. (See Appendix B)

Further attempts were made to involve local union leaders in employee-involvement activities, and as employees reported their positive experiences with this approach, local representatives began to become more involved in them. Local union representatives are now regular attendees at SP5 Panel meetings. Prior to the Company going forward with the Blockbusters self-managing work team, representatives of all unions whose members would be involved in the project were invited to a meeting where the purpose of the project was discussed, the proposed plan of action was reviewed, and questions regarding the project were answered. Advance notification of planned activities helped to eliminate suspicion and mistrust on the part of local union leaders. Union representatives were invited to attend weekly team meetings and advised that in the event any issues arose during the term of the project the Company would be willing to discuss the unions' concerns in an attempt to address them.

During this period union representatives were also invited to meetings with representatives of the various production departments within the yard in order to discuss methods to improve productivity and, thereby strengthen the Company's competitiveness.

At the time the project was to begin, NASSCO was beginning construction of two 209,000 DWT tankers. This work provided a unique opportunity to examine the benefits of self-managing, multi-skilled work teams. An area designated as Table 9 had been established for the assembly of web frames and egg-crate units for the tankers. Special jigs and fixtures were designed and constructed to facilitate the building of these units. All mid-body bottom shell, side shell, transverse bulkhead and longitudinal bulkhead units for both ships were scheduled to be built on Table 9. This area was chosen to begin NASSCO's examination of self-managing, multi-skilled work teams, both because a fairly steady flow of similar work was anticipated across the table, and the table was removed from the mainstream of steel assembly activities.

### **THEORY OF WORK TEAMS**

The self-managing work team approach to work design recognizes that social and technical systems need to operate jointly to produce a product in the most efficient manner possible. This approach involves creating relatively autonomous groups of employees who are collectively responsible for their output. These production groups should consist of individuals whose work is interdependent. They should be separated from other production centers so they can operate with relative independence within their work group. Their goals should be defined in clear and simple terms. Self-managing work groups enable supervisors to delegate authority and devote more time to overall development and planning. The objective of the self-managing work team is to optimize the relationship between the social system of the organization and the technology of the organization to increase

the quality of work life, increase output, and maintain adaptability to change. In the past decade this approach has been tried with success in a number of American companies, including General Foods, General Motors, Procter and Gamble, PPG Industries, Sherwin Williams, Cummins Engine, The Mead Corporation, H. J. Heinz, Dana Corporation, TRW, Rockwell, Shell Canada Ltd., as well as many smaller organizations.

Three basic conditions must be met in order for this approach to work. These are: task differentiation, boundary control, and task control. Task differentiation involves the extent to which the task of the group is autonomous, forming a relatively self-completing whole. The more autonomous the task of the group, the more differentiated is its boundary from other units in the organization. Self-managing work teams are normally composed of between 7 and 14 members, each large enough to accomplish a set of interrelated tasks, and small enough to allow face-to-face meetings for coordination and decision making. Tasks usually performed by separate units within the Company, such as quality control, maintenance, industrial engineering, housekeeping, and personnel, are often included in the responsibilities of each team.

Boundary control involves the extent to which employees can influence production activities within their area of responsibility. These include: A well defined work area, group responsibility for production decisions, and members skilled in the tasks to be performed in their work area so they are freed from dependence on external resources to perform their work. Boundary control requires the deliberate cross-training of team members to accomplish a variety of jobs, activities, or tasks.

Task control involves the degree to which the employees can regulate their own behavior to convert incoming materials into finished or semifinished products. Adequate task control includes: The freedom to choose work methods and schedule activities to match both the demands of the job and the environment in which it is occurring, and the ability to influence production goals to allow workers to modify their production output as different situations arise, such as parts shortages or unpredictable equipment breakdowns. Important in task control is the availability of direct feedback to employees of relevant measures of group performance which provides them with the knowledge of production results which allows goal-directed behavior to occur.

#### **NASSCO'S APPROACH TO WORK TEAMS**

NASSCO proposed to develop teams with a stable membership of multi-skilled employees. Area versus trade management would be used to supervise work. One supervisor was to be responsible for completion of work within the area, rather than having a supervisor for each trade being responsible for that trade's work. To the extent possible, teams were to be responsible for decisions necessary to complete work in their areas, including the planning and scheduling of work to conform to overall schedules, quality assurance, and housekeeping. It was envisioned that the traditional role of supervisor would shift in emphasis from "boss" to facilitator, wherein they would interact as liaison between the work team and other parts the organization, such as upper management, maintenance, materials, etc. Ultimate authority for decisions within each area would still remain with the supervisor. Besides receiving training in production skills other than their primary trade, employees were to be trained in basic problem-solving skills and team building.

Team operation was to be characterized by a high level of employee participation accomplished by daily start-of-shift meetings, as well as one-hour weekly meetings for the purpose of training and discussion of issues affecting the team. It was also envisioned that experts from different functional areas within the shipyard would be available to the team in the event such expertise was required.

By organizing in this manner, it was hoped productivity would increase for a number of reasons. First, a lead trade would no longer have to cease work if a support trade was not available to perform

a task incidental to the job. Second, with multi-skilled employees work of an incidental nature could be performed by the employee on the job. Third, because the work of lead and support trades would not have to be evenly distributed and well coordinated, significant wait time could be eliminated. Fourth, with greater control over their work environment and more information to influence how the work would be performed employees would have a higher level of job satisfaction and self-fulfillment.

By having one supervisor in charge of the table, emphasis was to be shifted to the completion of a particular product, rather than the work of a particular trade on that product. Savings were anticipated from the better coordination of effort which would result not only from having employees work together as a team, but also by having one supervisor responsible for all employees' efforts. By having a stable work group, it was hoped that employees would become familiar not only with the production tasks on Table 9, but also with each other. With the development of smooth working relationships and an intimate knowledge of the job, it was hoped that productivity would increase.

#### **TABLE 9 WORK TEAM**

**Support Staff:** In order to put NASSCO's proposal for the use of self-managing, multi-skilled work teams into effect, a number of preliminary activities had to take place: The appropriate trade superintendent had to be contacted and included in the planning for the establishment of the Table 9 work team, training activities had to be defined and charted out, orientation sessions arranged for employees assigned to Table 9, as well as monitoring activities on the table after start up. Most of these activities were handled by staff in the Personnel Programs Department of NASSCO, assisted by a senior staff engineer from the Production Department. These individuals included Dan Stravinski, Manager of Personnel Programs; Jerry Spiegel, Ph.D., Personnel Development Specialist; Lisa Lammens, Administrative Assistant; and Austin Herrick, Senior Staff Engineer.

**Start-Up Activities:** Team members were selected in a two-stage process. The support staff, noted above, compiled a list of employees from appropriate trades who had expressed an interest in participating in a project of this type and had previous experience in small group activities, such as quality circles. This was then submitted to the superintendent in charge of the steel assembly area, who then suggested additions and deletions. A list of team members was finalized and the core group of members were advised of their assignment to the table. In June, 1985 an off-site conference was held with team members and the various levels of management who would be interacting with them. The purpose of this conference was to introduce the concept of work teams to both management and the employees who would be putting the new form of organization to work. The details of the Company's proposal regarding the use of self-managing, multi-skilled work teams were reviewed, including the source of funding for the project, as well as major details regarding proposed team operation. The group was advised that with the changing shipbuilding technologies, an attempt was being made to better organize the production work force to work efficiently with the new technologies. The market forces driving the move to new shipbuilding technologies were also reviewed, including the weak market for new shipbuilding orders, as well as productivity improvements taking place in both foreign and domestic shipyards. Employees were advised that any actions undertaken by the Company during the term of the project would be accomplished for due regard for all union labor agreements.

Each employee who was to become a part of the team was interviewed to evaluate their attitude toward multi-skilled work teams and the project in general. Survey results indicated that most employees were unsure about attempting to work on a work team of this type. Fears were expressed regarding potential violations of union agreements, increased work with no increase in pay, and a general wariness of the Company's objective in attempting the project.

Initial training in brainstorming and cause and effect analysis was conducted and any questions the team members had regarding the project were answered during the orientation.

**Team Operation:** The Table 9 work team eventually consisted of groups operating on all three shifts. Although local union representatives were invited to attend the off-site orientation meeting, they chose not to and allowed the area shop steward representing employees on Table 9 to represent the local unions interest. Local union representatives were advised that they were welcome at team meetings and, periodically during the term of the project, local union representatives did, in fact, attend meetings.

**Supervision:** The initial project design called for one supervisor to be in charge of all of Table 9. In the beginning stages of the project, this was the case; however, as the work load increased a welding leadman was added, as well as a second shift with another supervisor. In addition to having the number of supervisors be over and beyond the original design, the individuals serving as supervisors were changed four different times on the first shift alone. Similar changes took place on the second and third shifts. Team members began expressing discontent with the amount and type of supervision they were experiencing. They had anticipated a much greater degree of autonomy than they were actually being allowed. A part of this difficulty stemmed from the team's misconception that there would be no supervisor at all on the table, when in fact at the June orientation meeting, the team had been advised that a supervisor would be in charge of Table 9.

A valuable lesson was learned regarding the importance of properly choosing and orienting supervision for a project of this type. Some supervisors involved with the project had difficulty in making the transition from boss to facilitator. A great deal of resistance was encountered to having employees make decisions regarding their work. Most supervisors were still very much interested in monitoring and controlling rather than becoming an "enabler" to assist employees in becoming more responsible for their job. An interesting dynamic could be observed as this interaction evolved. When employees were given additional responsibility for their work they were more than willing to take on the responsibility and follow through with it. However, when supervisors in the area began to step in and take more control over the work, employees then went to the other extreme and tended to wait for direction prior to exercising any initiative. Competition between shift supervisors and trade supervisors on a given shift also appeared. This competition hindered productivity in that the work of one trade or shift was performed without regard for its impact on another trade or shift with responsibilities for completing work on the unit. As team members became aware of this unhealthy competition, morale was also adversely affected.

In order to address these problems, a series of meetings were held with senior management in the steel assembly area where the fact that one supervisor was in charge of the area was reemphasized, and that performance in this area would be judged on how well the team, not any individual trade, was able to perform. In some areas problems continued and eventually the supervisors who had difficulty adapting were reassigned to other areas of the shipyard. Proper selection and orientation of supervision is absolutely critical for a high commitment form of work organization to be successful.

**Training:** A critical task facing the support staff at the outset of the project was the training of team members in both the technical and the group process skills they would require in order to function effectively as team members. In order for a self-managing, multi-skilled work team to work, members of the team had to broaden the range of skills they currently possessed. Most team members were members of well-defined trades with a relatively narrow range of skills. Training in group process skills was viewed as necessary in order for team members to function effectively in a small group. Problem-solving skills had to be developed in order for the team to be effective in identifying problems within their work environment, analyzing them, and developing workable solutions to them. Training was also required in ancillary skills necessary for the group to become fully responsible for their work. These included topics such as scheduling, budgeting, statistical process control, and decision making. In order to determine the technical training required for group

members, a technical skills assessment was conducted to determine existing skill levels and areas of skill deficiency. Team members participated in a self-assessment of their skills in shipfitting, blueprint reading, gravity feed, TIG, MIG, and stick welding, grinding, chipping, layout, and burning. (Figure 1) Team members ranked themselves either good, fair, or poor in each of these areas and indicated whether or not they desired additional training. The skills assessment form was separated into the two trade categories of welding and shipfitting to determine the types of training required to "balance" each trade.

At this point in the project another difficulty arose in that no time, other than the one-hour weekly meeting, had been budgeted for training activities. Because there was no budget, supervision could not release workers from the job in order to be trained in different skill areas.

In order to address this problem, members of the support staff approached senior management in the Production Department to request a budget for training in order to accomplish this task. After a review of training needs a budget of 30 hours per week was agreed to by senior management, production management in the steel assembly area, and supervision on the table. Once a budget was obtained, a training matrix (Figure 2) was designed to assure that a structure existed to make sure each individual on the team received training in areas where they lacked skills. A number of different locations and mediums were to be used in accomplishing training. These included: Utilizing the Company's welding school to provide welding and burning skills, work site training in supervisory tasks, class room training in problem solving techniques, communication skills, and having trainers from different functional departments, such as Rigging and Engineering, provide sessions on their areas of responsibility. Technical skills training did not begin before November 1985 because the team had not yet worked out a number of issues regarding team operation. These issues included: Incentives for exceptional performance, and job security, as well as group process issues. The level of autonomy of the team was at issue, as well as uncertainty of group members as to how to act in a group setting, etc.

During October 1985 a subcommittee on each shift, composed of two welders and two shipfitters, was set up to develop training to provide multiple skills for the team. This subcommittee acted as a liaison between the work team and management to effectively represent the training concerns of the work team. As training got underway shipfitters learned to weld, welders learned to fit, both trades practiced rigging, layout, and daily blueprint reading. By the end of the project five (5) shipfitters had been promoted to shipbuilders (a higher classification paying more for additional skills), eight (8) shipfitters had been certified in MIG welding, and two (2) production welders had been promoted to code welders. All were given certificates for their achievements.

During the beginning stages of the project, meeting time was used to show films and video tapes on different work teams in use throughout the world. This was to ensure that the team understood the concept and what was expected of them.

Discussions followed each film or video concerning how team work could improve productivity and how the exchange of ideas among team members could improve morale and effectiveness. These discussions helped open up the lines of communication among work team members. Team members related experiences and techniques which were useful to them in the conduct of their job. This activity helped team members to become more comfortable in functioning within the group. Every attempt was made to develop both the technical and social skills required in order for individuals to become effective team members. Developing and implementing a training plan which will provide employees with the skills noted above can be a very difficult task in a fast-paced production environment. There is a natural and understandable tendency to forego scheduled training when another few hours will allow a unit under construction to be completed. All members of management associated with the work team, as well as work team members themselves, must accept the





# TRAINING SCHEDULE

PREPARED BY \_\_\_\_\_

DATE \_\_\_\_\_

MONTH	NOV. '85	DEC. '85	DEC. '85	DEC. '85	JAN. '86	JAN. '86	JAN. '86	JAN. '86	FEB. '86
WEEK NO.	48	49	50	51	2	3	4	5	6
DAY	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F	S S M T W T F
SHIPFITTER 1	A	E E E		C			D		B
SHIPFITTER 2	A			C				D	B
SHIPFITTER 3		A				C		B	D
SHIPFITTER 4	D		A			C		B E E E	
SHIPFITTER 5		D	A		C		B		
WELDER 1				A	C		B		
WELDER 2				A	C		B		
WELDER 3			C		A		B		
WELDER 4			C		A B				
WELDER 5			C		B A				
WELDER 6		C		B		A			
WELDER 7		C		B		A			
SHIPFITTER 6			B			D	A		C
SHIPFITTER 7	D		B		E E E		A		C
SHIPFITTER 8		B D					C	A	
SHIPFITTER 9		B			D		C	A	
SHIPFITTER 10	B			D				C	A
SHIPFITTER 11	B		D					C	A
TRAINING HOURS PER DAY	4 4 6	4 4 12 12	4 4 1 6 4	4 4 1 6 4	4 4 9 12 12	4 4 1 4 4	4 4 1 4 4	4 4 9 12 12	4 4 1 4 4
TRAINING HOURS PER WEEK	14	44	19	19	41	17	17	41	17
LEGEND:	A - MANAGEMENT OVERVIEW M/F 7:00-11:00 AM B - BURNING T 7:00-9:00 AM C - CHIPPING TH 7:00-9:00 AM D - GRAVITY FEED WELDING W (1HR) E - MIG WELDING W/TH/F (ALL DAY)								

FIGURE 2

**Cross-Trade Work:** The bulk of the work required at Table 9 was shipfitting and welding. Although other trade work was required, such as chipping, grinding, rigging, layout, and burning, all work on the table was performed by welding or shipfitting personnel. The original design called for shipfitters to be trained in welding and welders to be trained in shipfitting, so that when one group or the other ran out of work they could immediately begin performing work of the other trade. Since welders normally followed shipfitters on the job, it was felt that a good opportunity existed to increase productivity by allowing shipfitters to perform some welding when they had accomplished their work on the unit. Similarly, welders could be helping shipfitters prior to the time that any production welding work was required on a unit. This approach towards task completion would also allow a much more stable group to remain at the table.

A problem of trade-oriented supervision soon became apparent when some members of supervision advised team members that they were not to perform work outside of their trade, although they were capable of doing so. These kinds of instructions had a detrimental effect on team morale, as team members were both willing and able to perform tasks, they had been told they would be allowed to do, and the opportunity was now being denied them. Over time this problem should begin to disappear as supervision becomes more area, and less trade oriented. However, attention must be paid to how supervision's performance is judged if these kinds of problems are to be eliminated. For example, if a welder completes his job and begins helping a shipfitter, whose budget should be charged for the time?

The answers to such questions will have obvious impact on the willingness of supervision to utilize employees in cross-trade work. In areas where the cross-trade work was incidental to the primary task of the employees, a substantial amount of activity occurred. Team members performed their own rigging, chipping, grinding, and layout. Training sessions were held with employees in order to make sure that where a potential safety problem existed, employees were aware of how to do the job safely.

## START-UP PROBLEMS

**Process Issues:** During the beginning stages of work team development on Table 9 a number of problems arose which required resolution prior to any gains being made in productivity or employee satisfaction. Since the team had been drawn from a wide variety of areas, and consisted of members with varying degrees of experience in small groups, various process issues had to be addressed in order to get the team functioning smoothly. Certain individuals were reluctant to talk during team meetings regardless of the quality of their ideas, other individuals were more than happy to talk regardless of what they had to say. There was much discussion regarding the ground rules of team operation. Questions were raised as to what would be done in the one-hour weekly meetings, whether individuals could transfer off the team if they so desired, and who was responsible for actually running the meetings. Each of these items had to be worked out before the group felt comfortable in going on to other topics of discussion.



**Pay Incentives:** An important issue for the group was that of pay or incentives for whatever improved productivity they were able to demonstrate. Regardless of any productivity increase, individuals on the team felt that since they were being requested to do "more", because of the Company's attempt to provide multiple skills to employees, they should receive more money regardless of any productivity increase. Group members were advised that no special plans had been made to either provide incentives to the group or provide extra pay to them; however, in the event individuals did develop the multiple skills available on the table, higher classifications contained in the labor agreement were available to them according to seniority. A number of individuals on the team did, in fact, receive promotions to these higher classifications before the end of the project.

Group members were advised that the matter of incentives and wage increases were negotiable matters between the Company and the union and could not be acted on unilaterally by the Company. The labor agreement provided the Company the opportunity to utilize employees in a variety of capacities and specified under what conditions extra pay would be in order. Employees were advised that job assignments would be made according to the contract and that the contract would govern the rate of pay for such assignments. Although pay and incentives were an issue, once it had been thoroughly discussed and a decision communicated to the team, most team members were still interested in participating in the work team project without extra pay or incentives.

**Autonomy:** In the very early stages of the project only a few members of the team were assigned to the table and there was only one supervisor present. During this period, team members had a substantial degree of autonomy and made most decisions regarding completion of their work. As the work load increased employees were added, as well as another supervisor. Employees began to feel they had less autonomy than originally planned and began to voice discontent over this fact. There was a degree of misconception on the part of some team members as to the level of autonomy that would exist on the team. Some team members expressed the opinion that they had been assured there would be no salaried supervision on the table, despite the fact written minutes of the team's first meeting indicated that there would be a supervisor in charge.

A few months into the project a second shift, along with another supervisor, was added. Although the second shift supervisor was advised that the first shift shipfitting supervisor was the person responsible for all the shifts on Table 9 and that employees were to be given as much responsibility for completion of work as was possible, difficulties were encountered in making this come to pass. The individual assigned as second shift supervisor had been promoted to salaried supervisor just after the project had started and was not comfortable in delegating responsibility to his employees. Despite continued attempts to properly orient this individual, his supervisory style continued to be directive until he was removed from the table and assigned to another area of the shipyard. His lack of cooperation with the first shift and his directive style both served to interfere with the team meeting its objective of increased productivity and employee satisfaction.

**Role Definitions:** A number of individuals involved with the project had roles which had to be modified to fit into a work team organization. Supervision had to modify their traditional role from that of a monitor and controller to that of an enabler and resource person. Union representatives assigned to the table had to walk a fine line between being a contributing member of the team and representing the interests of the employees working there, as well as the union as an institution. Employees were in the difficult position of being in a new and different type of work organization where they were supposed to have more control over how the work was performed and the environment in which it was performed, while at the same time receiving some conflicting signals from supervision as to whether this type of conduct was appropriate or accepted. The support staff responsible for the project had to make sure that the structure, resources, and personnel were available to have the project occur

as planned, while at the same time taking care not to exercise too much control over the group whose objective was to control themselves.

As the work team developed, individuals began to define their roles and the team adapted to it. The support staff began to take a lower profile in team meetings and team members began to be more universal in their participation, both in meetings and on the job. As union representatives began to see the benefits of this type of work organization, more effort was put into improving the work area through the use of problem-solving skills and ability to influence decisions made in the area, rather than immediately choosing an adversarial approach to problem resolution.

The difficult role of supervisor in a company beginning a change to a high involvement management style will be addressed in the following section. A number of different supervisory styles were evident in the individuals who functioned as supervisors in the Table 9 work area.

### ONGOING PROBLEMS

**Supervision:** One of the most difficult problems to overcome in the development of the work team on Table 9 was the amount and style of supervision. On first shift there were two supervisors, each with the responsibility for a different craft. There was one supervisor in charge, however on a day-to-day basis both supervisors were directing the work force and using somewhat different supervisory styles. One of the supervisors was more inclined to control and monitor the employees working for him, than allowing them to take responsibility for their work and make decisions affecting it. The employees became dissatisfied with the approach and saw it as the Company backing away from the original design of the project. This created difficulties not only with the productivity, but also with the human relations aspect of the work team. Because the supervisor in question had worked in only one trade, his trade orientation began to impact how the project was run. Although team members were willing to perform work outside of the classification to which they were assigned, there were times when the supervisor instructed them not to do so. This kind of activity had obvious negative effects not only on creating a multiskilled work force, but also on developing individuals which felt responsible for making decisions regarding how the work could be done most efficiently, and their willingness to carry out those decisions.

The fact that two supervisors were assigned to the table on first shift also made it difficult to test the self-managing team concept to its fullest. Since someone was always there to direct them, the tendency was to wait for direction or ask for it, rather than making independent judgements and acting on them.

Added to these difficulties was the problem with supervisory turnover. As noted previously, the table had four different lead supervisors over the course of the project. Each of these individuals had to be oriented as to the goals of the work team, its structure, method of operations, and personalities involved. As would be expected, when a supervisory change was made, the new supervisor normally felt a need to supervise, otherwise known as monitoring and controlling. The changing of supervision also disrupted the social system that was developing among the team. Each supervisor had a slightly different style and, as a result, it took some time before the team knew what the new rules of the game were. What may have been acceptable under one supervisor may not have been acceptable under the new one, decisions which could be made by the team under one supervisor were not appropriate under the new one. Needless to say, this created uncertainty on the part of team members which inhibited independent judgement and action.

**Training:** A further limiting factor on the development of a fully-functional self-managing, multi-skilled work team was the difficulty in arranging for training in all skills required to produce units on Table 9. Although a training matrix and schedule had been developed and agreed upon, production pressures often disrupted the sched-

ule and resulted in employees completely missing their opportunity to train in a particular skill. It should be noted that this difficulty too can be traced back to the orientation of supervision on the table. Although production pressures certainly existed, opportunities also existed for training of employees on the table. These opportunities were too often neglected and as a result the level of multi-skilling and its use on the job did not reach the levels anticipated at the outset of the project. Employees did have the opportunity to practice skills other than their own on the job, however these opportunities were more limited than would have been appropriate in order to develop a truly multi-skilled work team.

#### ACCOMPLISHMENTS

It was hoped that benefits would be gained both in increased productivity and improved human relations with the work team organization. On Table 9 it appeared that both these goals were met.

**Human Relations:** The results of a survey provided to long-term Table 9 team members indicate that the project's human relations goals were largely met. (Appendix A, Question 5) Most team members indicated the work team was a positive experience for them. Team members also indicated that although the work team concept did not meet all of its goals it was a better experience for them than the typical NASSCO work situation. Team members further indicated that working together as a team helped to increase motivation, job awareness, and morale. Out of the 42 questions asked on the survey, questions concerning these areas were responded to most favorably.

Team members also indicated that getting more information about the work helped them do a better job. Survey respondents indicated substantial satisfaction with the work team concept by their positive responses to questions as to whether they would rather be assigned to a traditional NASSCO work area or again be members of a work team. Employees felt work teams were a positive idea and should be tried elsewhere at NASSCO. Work team members further indicated that the work team concept could have worked better with less supervisor direction and more worker responsibility. Team members

felt their communication, problem identification, and problem-solving skills were improved and that they were able to function at a higher level of independence than the average NASSCO worker.

**PRODUCTIVITY**—Judgements as to productivity improvement which resulted from use of a work team, as opposed to a traditional trade oriented work force, are difficult to make. Table 9 had changes made to both the technical and social aspects of work. In order to construct the mid-body sections of the tankers special jigs and fixtures were designed and constructed. Egg-crate type of construction was used to eliminate collars, reduce the amount of out-of-position welding, and improve material flow. Separating the effects of the technical and social interventions made at this table were difficult, if not impossible. Ideally, a comparison would have been made between two areas producing comparable products with identical facilities and equipment available to them. One of these areas would have been organized around work teams and the other with a traditional trade orientation. This approach was not possible since the production plan was to have all mid-body sections of the tankers produced at Table 9.

An added difficulty arose from the fact that the capabilities of Table 9 may have been overestimated and in order to meet schedules untrained individuals, without appropriate orientation towards working as a member of a team, were assigned to the table during peak periods of activity. This activity impacted the effectiveness of the team and reduced its efficiency. (A substantial amount of overtime was also worked during certain periods thus impacting performance to budget.) The only opportunity to make judgements on productivity performance is to examine Table 9's performance to budget and compare it with other areas of the shipyard constructing substantially similar units. Figure 3 shows a graph of performance to budget by week for all of Table 9. At the beginning of the project, the Table 9 work team was well over budget. As time passed, a steady improvement in performance occurred between weeks 31 and 41. The team was successful in remaining under budget through week 52. The team had mixed results thereafter, however with a positive trend occurring after week 18 of the following year.

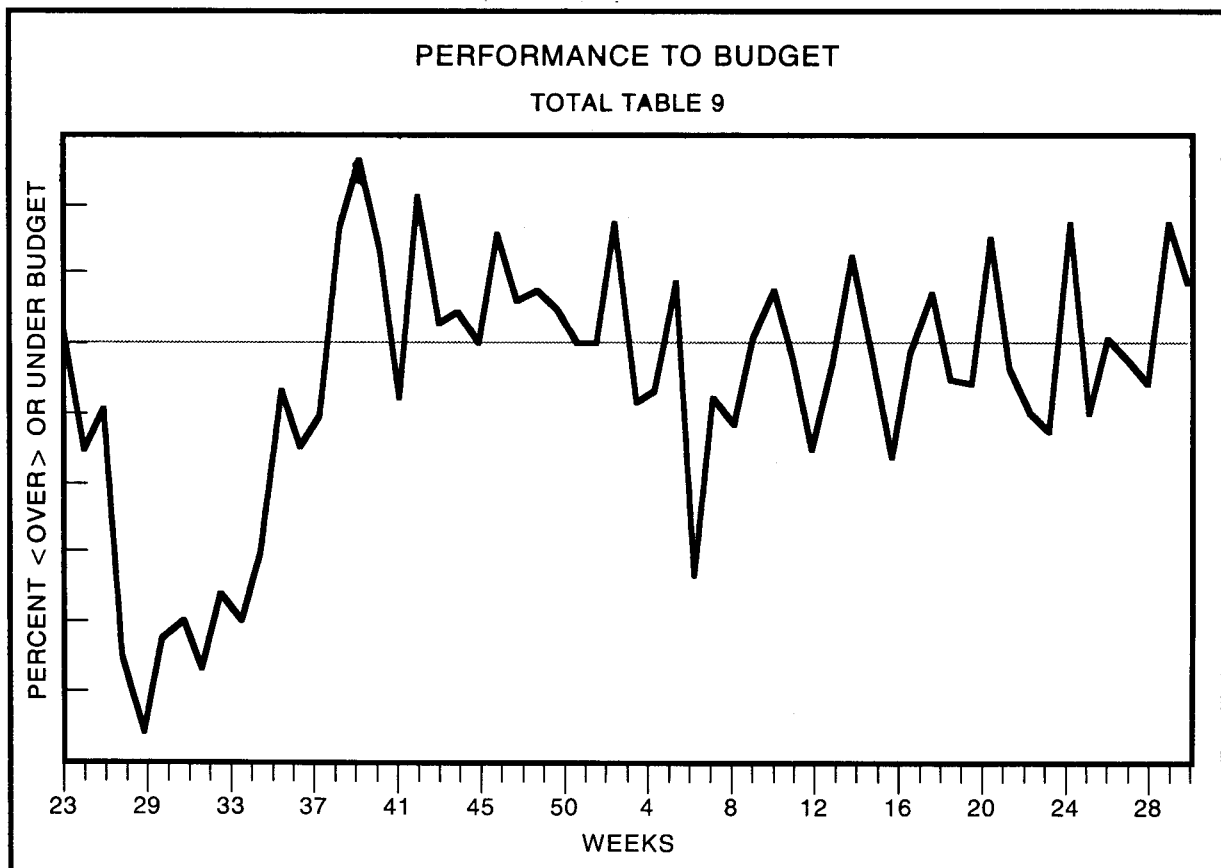


FIGURE 3

In examining this data it is useful to view the performance to budget by week graph with the number of egg crates per week graph. (Figure 4) Where a deterioration of performance to budget occurs it is normally associated with a peak in the number of egg crates produced. As previously noted, these periods were also characterized by the addition of lower-skilled employees who were not familiar with the work team concept.

Figures 5 and 6 show the cumulative budget and actual hours versus time for all trades on Table 9 versus all trades producing flat units in other areas of the shipyard. These graphs show that Table 9 maintained a consistent variance in budget versus actual hours over time versus a steadily widening variance by all trades producing flat units.

Attempting to discern a reason for the difference in performance in the two areas is fraught with difficulties. It can be said that the work team at Table 9 did a better job in adhering to its budget over time than workers in other areas were able to do. Given the imperfect application of the work team concept at Table 9 one can only wonder what the performance of the work team could have been, had there been consistency in supervision, additional skills training, greater worker determination of when their multiple skills could have been used, and a more active involvement in setting production goals. Some insight can be gained as to the answers to these questions by examining the performance of another work team which operated at the NASSCO facility in July and August of 1986.

#### BLOCKBUSTERS WORK TEAM

The Blockbuster work team's evolution from a quality circle meeting one hour per week, to a multi-skilled, semi-autonomous work team is a classic textbook case of the impact of worker involvement on increased performance. The Blockbusters were formed as a multi-trade quality circle of people working in the on-block area of NASSCO. In this area, a number of trades were responsible for working together to outfit a variety of units with ventilation, electrical, and piping items, as well as miscellaneous steel outfitting items. After the group

had been meeting for about a year as a quality circle they were presented with the possibility of becoming a work team. The work team suggestion had been made to the group once before, but for various reasons the group did not express a sufficient amount of interest in the concept to move forward at that time. After the Table 9 work team had wound down its activities and news of its operation began to be widely disseminated throughout the yard, the Blockbusters revisited the idea of forming a work team themselves. The group developed a proposal to management which outlined the work they were interested in performing, the individuals who would be assigned to such work by trade, the information they felt which would help improve their performance, and the expected benefits from the work team method of organization. After discussion of the idea was held with both the on-block manager, and the director of Outfitting, authorization was granted to proceed. It was agreed that the Blockbusters would be responsible for outfitting part of the house unit for Hull 439, the second of the 209,000 DWT tankers. Many of the members of the group had worked on the first house unit for Hull 438, the sister ship and predecessor to Hull 439.

The group met with the on-block manager and developed a plan for outfitting the unit. Other trades who were not members of the Blockbusters quality circle were recruited by the team. Once the team was complete, they spent eight hours in two planning meetings before the work started. During the course of the project they continued to meet one hour per week as a quality circle and started every work day with a brief start-up meeting. Work on the 439 house unit took approximately 11 weeks to complete. The Blockbusters work team was able to produce the Hull 439 house unit 14% under budgeted man hours and with 36% fewer man hours than the identical unit on Hull 438. It should be noted that the budget for Hull 439 had been adjusted downward to account for the learning curve which was anticipated because it was a follow-on unit. A number of factors contributed to the success of the Blockbusters work team. Each of these factors are considered in detail below, and contrasted with the Table 9 experience.

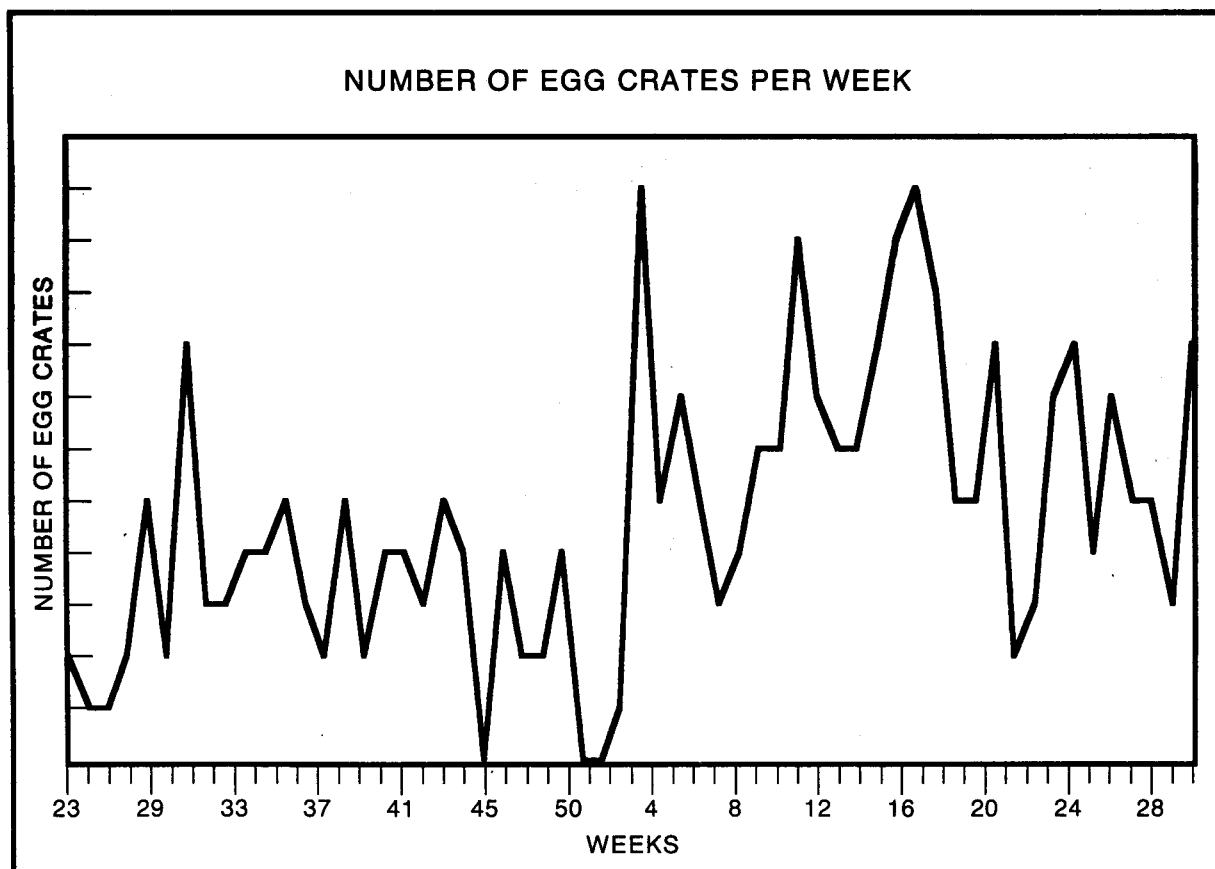


FIGURE 4

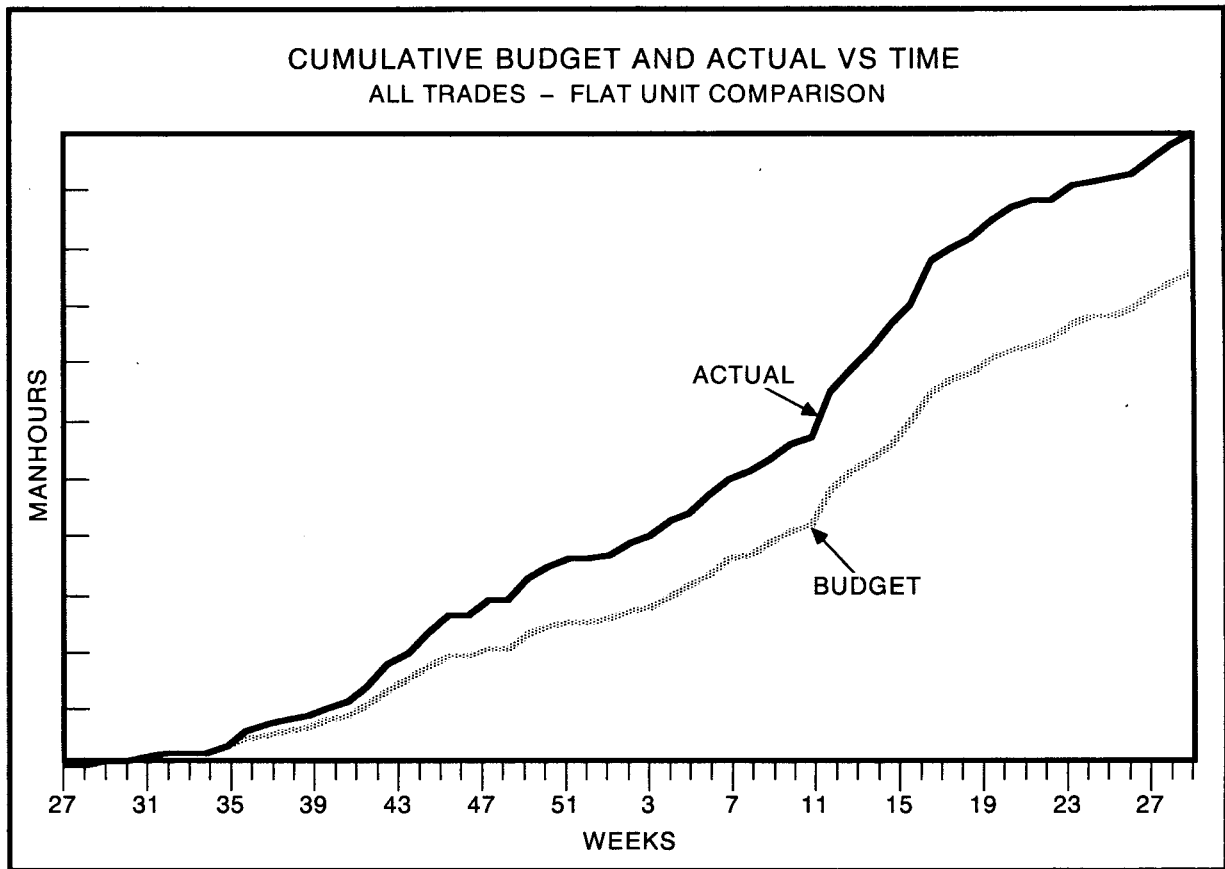


FIGURE 5

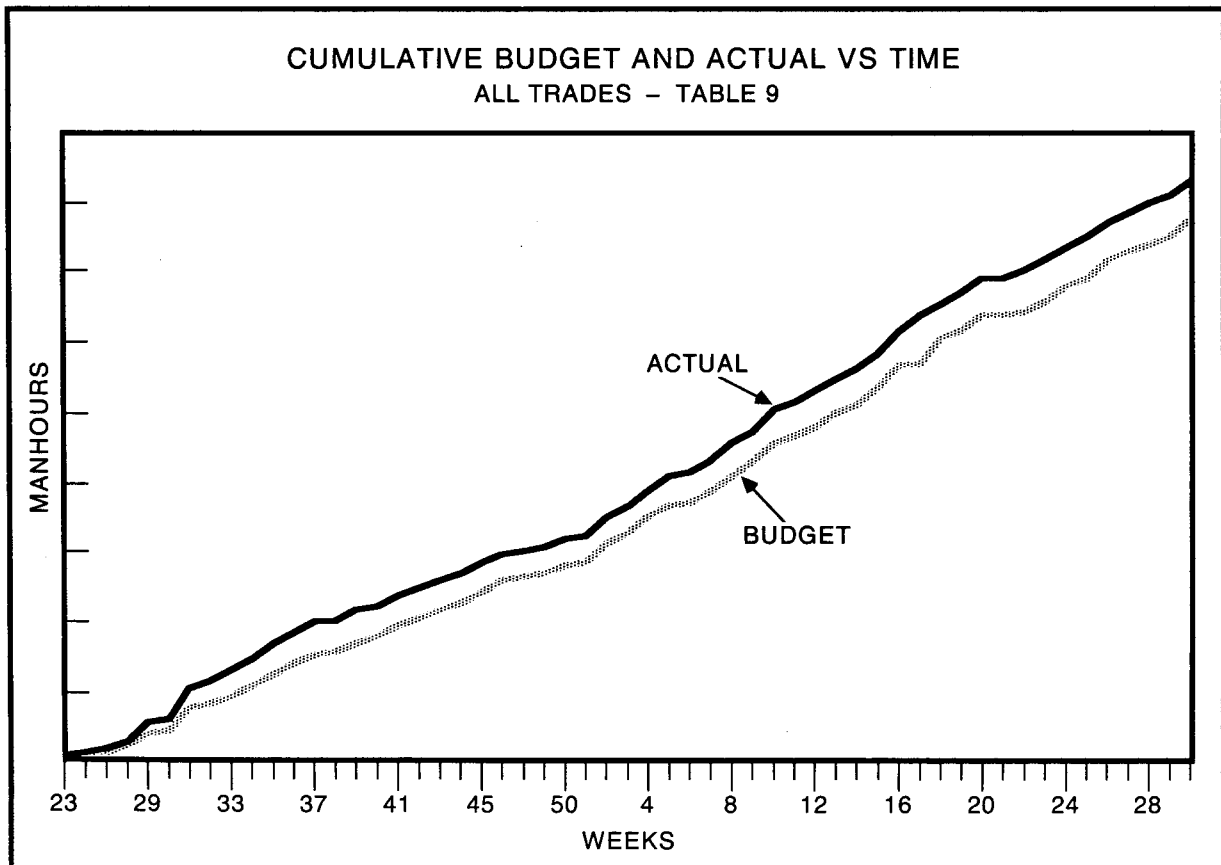


FIGURE 6

## ATTRIBUTES OF THE BLOCKBUSTERS WORK TEAM

**Supervision:** The Blockbusters had no assigned foreman. Two of the team members, one of whom was the union shop steward, served as coordinators of the team, and a liaison to management was appointed to sign time cards and interface with management as required. The quality circle facilitator also helped the group plan and coordinate its activities. Under normal circumstances three to four foremen representing three to four trades would have directed and controlled the activities of the various team members. The Blockbusters controlled themselves. The liaison to management, referred to above, was often times not at the work site. If the team members required his services he was called upon as they felt necessary. Team members decided what they were going to do on any given day and how they would do it. They controlled their work and were able to complete one job before being reassigned to another. A number of team members commented on the importance of this dimension of control. Work team members were able to consult with technical experts in the Engineering Department, as well as being able to leave their work area to view how the unit was going to be installed on-board so that the work they were currently performing could be done in such a manner so as to avoid problems later on.

**Selection:** All members of the work team were self-selected. The members of the Blockbusters quality circle chose to give the work-team concept a try and they, in turn, recruited volunteers from other required trades in order to fill out the team.

On Table 9 many of the members had been assigned to the area. A minority of team members were volunteers at the outset of the project.

**Group Dynamics:** The Blockbusters were functioning as a team prior to taking on the Hull 439 house unit assignment. They had been meeting as a quality circle for more than a year and, therefore, had already developed their skills in problem identification, selection, and analysis. Group process issues had already been resolved, in that the group was capable of holding meetings with a minimum of conflict and maximum participation on the part of the members. For the most part the work team was homogeneous in terms of skill level and ability to communicate, therefore interaction among team members was able to occur without cultural or language barriers. Group members already had a feel for who the natural leaders in the group were, as well as an idea of the role in the group that each member played. Because the group had already developed as a team, they could concentrate most of their effort on the task at hand rather than dwelling on group process issues, such as, how to hold a meeting or how to select a leader.

Table 9 had few of these process issues worked out at the beginning stages of their project. Much time was spent in meetings attempting to determine how leadership of the group would be handled, getting all members to participate in group meetings, focusing energy on solvable problems, and defining clear goals for the group.

**Goal Setting:** During the initial planning sessions for construction of the house unit for Hull 439, work packages were examined and team members estimated the amount of time it would take them to complete the work. Only after this process had been completed were team members given information on the actual budget figures for each work package. Team members were provided weekly information on number of man hours expended for each work package on the unit. By the end of the project most team members were as accomplished at reading the Company's labor/management reports as the average supervisor in the yard. Team members were aware of how they were doing and worked together to accomplish their productivity goals. In contrast, workers on Table 9 did not have access to timely and specific performance feedback information by which they could gauge their progress. Team members were aware of the budget and schedule for particular units, however, there was no formal process established whereby team members could set goals for productivity improvement. Goals which are attainable, measurable and decided upon by the work team are important factors in increasing productivity.

**Multi-Skilling:** One of the primary goals of the work team was to develop multiskilled workers. The Blockbusters were more limited in this regard than workers on Table 9 since the Blockbusters were made up of individuals represented by at least four different unions. The employees and their union representatives were advised, at the outset, that any multi-skilling that took place would be accomplished with due regard for union labor agreements. As such, the amount of multi-skilling that could take place was more limited than that which could occur on Table 9. It should be noted that regardless of union agreements, there is a limit to the multi-skilling which could have taken place given the nature of the work involved. Some trades, such as Electricians, are so highly specialized that to train workers from another trade to a sufficient level of competence to be a productive member of the team in that speciality would have been prohibitive. In discussions with team members and other individuals familiar with the team operation, most of the productivity gains which occurred resulted from better planning and coordination of activities among the trades assigned to the unit, improved amount and quality of communication among team members, and willingness on the part of team members to help each other out with the "helping hand" type of work where necessary. For example, if a pipefitter required a hand in moving a piece of pipe to the work area any team member was willing to help out to get the job done. This kind of activity required no specialized knowledge but was essential in order to maintain a smooth work flow. Some team members were able to pick up skills that they did not have prior to becoming team members. However, because of the limited duration of the work, and limited need to develop multiple skills among team members, this aspect of team operation was less important than others already noted. It should be noted that some team members had already been trained in the multiple skills which the Company felt were necessary in order to increase their effectiveness. For example, pipefitters, sheetmetal fitters, and electricians had received training in welding and burning such that they were able to utilize these processes to perform tasks that were necessary to progress their work.

**Union Involvement:** Prior to the start of the Blockbusters work team project all union representatives whose members would be a part of the team were invited to a meeting to advise them of the nature of the work team project, to answer any questions that they had regarding it, and to attempt to arrive at some understanding that team members would be operating as flexibly as possible within the constraints of the labor agreements when accomplishing work. Union representatives were invited to attend weekly team meetings, in the event they desired a more in-depth view of team operation. This meeting was an important one in making sure that the unions were advised up front as to what the Company's plans were, and why the project was being undertaken. A substantial amount of mistrust and suspicion was avoided by taking this approach. Too often in the past, projects such as this were undertaken without advance notice to the unions involved, thus putting them in a reactive mode. This too often resulted in union representatives reacting to every perceived encroachment on their jurisdiction with grievances and other disruptive activities. As it was, the union shop steward was also one of the team coordinators. Given this level of representation, there were minimal problems during the project with union jurisdictions being infringed upon, while at the same time maximum flexibility was exercised by team members to get the work done.

**Management Support:** From the beginning of the project, the Blockbusters received steady management support at all levels. Management in the Outfitting Department, in general, was much more supportive of employee involvement than that found in the Steel Department where Table 9 operated. The on-block manager met with the team and agreed with the proposed method of operating. The ground rules were reviewed and approved by the Director of Outfitting. Each of the trade superintendents, who were to supply man power to the team, were advised of the new approach, and asked for their cooperation in supporting it. During the course of the project, with few exceptions, this support was forthcoming. Ironically, the form this support most often took was a willingness on the part of management to keep "hands off" of the team's activities. Where the team required support in obtaining materials, information, or expertise, it was provided.

The individual chosen as liaison to management also made it clear to the team that he was there to support them, not to direct them. The team could rely on him to interface with management and to provide them with information or materials necessary for them to complete their work. The quality circle facilitator was also quite helpful in providing information on the team's performance and in keeping the team working as a functional unit.

As noted previously, Table 9 received mixed messages as to the level of management support for the project. Supervision was assigned to the table over and beyond that initially recommended, supervisors were changed during the course of the project, and some supervisors were not fully in tune with the goals of a self-managing, multi-skilled work team.

**Worker Skill Level:** The Blockbusters work team consisted of experienced workers with substantial seniority. All workers spoke English and had the necessary skills within their trade in order to accomplish the work assigned to them. Team members were familiar with yard procedures, information sources, and the responsibilities of various functional departments such that they could handle most problems themselves. Team members were not only willing to function as a team, they were able to as well. The capabilities of team members must not be overlooked when designing effective work teams. It is unrealistic to expect an individual with minimal job skills and knowledge of the organization in which the work takes place to function as an effective team member.

Table 9 experienced problems for these very reasons. Work was being accomplished during a period of rapid expansion of the work force resulting in the relatively unskilled workers being assigned to the table. Many of these workers came from diverse cultural backgrounds with limited language skills. Under these circumstances much would have to be done before team members would become truly self-sufficient, and able to work as a self-managing, multi-skilled work team.

**Stability of Work Group:** The Blockbusters remained as a continually associated team from the start of the 439 house unit to its finish. Although some individuals were assigned to the unit only temporarily, the core members of the team remained until the end. Team members were able to get a feel for the capabilities, working styles, and expectations of their co-workers, and thus become a productive work team. Without this kind of self-knowledge, a group would have difficulty functioning smoothly in dealing with problems concerning the team.

Although the work group at Table 9 was more stable than that found in most NASSCO production areas, some movement of personnel still occurred. If there was not work on the table, individuals were reassigned to different areas of the yard. If a peak in production demand occurred, new employees were assigned to meet schedules. This kind of activity made it more difficult to develop the sense of team work that is necessary in order to reap the full benefits of this approach.

## LESSONS LEARNED

In any project such as that undertaken here, the experience gained in actually implementing a concept that looks simple on paper, usually results in a broadened understanding of all of the necessary elements which must be in place in order for the concept to work. NASSCO's experience with the Table 9 and Blockbusters work team was no exception. The following points revealed themselves as being particularly important in implementing multi-skilled, self-managing work teams.

**Orientation of Management/Supervision:** In order for a self-managing work team to work, all members of management who will interact with the team must be properly oriented with specific instructions from top management. Responsible supervision must be made to understand that their job is not to monitor and control, but rather to provide the necessary materials, information, and interface with the organization to allow the team to perform the job they were hired for.

If an organization is attempting to have employees become more responsible for their work, they must allow them to be responsible. As soon as a member of supervision or management begins to take responsibility for decisions which are rightfully that of the team, team members will no longer feel responsible for what they are doing, and they will wait for direction rather than exercising initiative and taking action as the facts dictate.

Workers who are advised they are responsible for a given portion of work will use whatever skills they have in order to accomplish that work. If management/supervision advises them they are limited in the skills they are to use, it should not be surprising when workers are unwilling or unable to exercise a broad range of skills.

If supervision acts irresponsibly with regards to schedule adherence, adherence to company procedures, etc. the team will likewise be irresponsible.

The right choice of individuals to manage team operations is absolutely essential in order for the concept to work. Appointing a highly authoritarian individual to be responsible for work teams will do them in before they start. A much more appropriate choice would be an individual who feels comfortable in delegating responsibility, is willing to train individuals to the limit of their abilities, and is willing to reward initiative and performance when it occurs. NASSCO's experience with work teams has demonstrated that employees will work responsibly with a minimum of supervision. As long as individuals have the necessary skills, materials, and information regarding the work to be done, they will, in most cases, perform it to the best of their ability. In a team atmosphere, if an individual chooses not to carry his or her weight, other team members are normally more than willing to exert the necessary pressure in order to bring the offending individual's performance into line.

**Feedback:** In order for employees to continue to improve their performance they must first know how they are performing. Without timely, understandable information on team performance, goal setting is difficult at best, and improvement in performance difficult to come by. When performance information is provided, employees become conscious of how they are performing, and interested in improving their performance. As employees begin to understand how their performance is judged, they will take steps to improve it.

Without performance data, work teams do not have a focus for their efforts and performance will suffer. The establishment of measurable and attainable goals is also an important factor in team performance. The Blockbusters were involved in setting a goal they felt was attainable, and they did, in fact, attain it. Although goal setting was one area where more activity could have taken place in both work team projects, it was apparent that where goals were set attempts were made to reach them.

**Stability of Membership:** As previously indicated, having a stable group of employees as members of a work team is necessary for it to operate at maximum efficiency. To the extent individuals get to know one another, and develop an understanding of how each individual works, the team will function more smoothly. If the team is constantly being disrupted by new members who are unaccustomed to the way the group operates, its efficiency will be adversely impacted.

In shipbuilding this is a difficult issue to address. Man power is often transferred from one job to another, and the nature of the work itself militates against having the same individuals performing the same sorts of tasks in the same place over time. This raises an important point, in that some provision must be made to properly orient and train new members of work teams. Some of this may occur naturally on the part of work team members themselves, however some structure should be established to make sure that new members coming in understand how the team operates, and where they can go if they require additional skills to function as a fully qualified member of the team.

Outflow of members must also be addressed. In the case of the 439 house unit one difficulty encountered was having the team reduce its size commensurate with the amount of work remaining on the unit. As work was completed, members wanted to stay with the team rather than being reassigned to another area of the shipyard. Some method must be established in order to deal with this reality. This problem would be more manageable in an environment where other similar blocks were available to work on, either in parallel or in sequence where continuity could be maintained.

**Organizational Structure:** The proper organizational structure must be in place in order for work teams to be successful. An example would be the use of area rather than trade management in those areas where work teams are in use. With the area management approach, one individual would be responsible for all work performed in a particular area or on a given product regardless of the trades involved in producing it. This type of organization would be preferable to a trade organization where individual trade superintendents would be responsible for allocating resources to accomplish a given task. With members of all trades reporting through a given area manager, no conflicting signals are given to the work force as to what priorities are on a given day, or what kind of performance is acceptable over time.

If multi-skilling is to take place, some provision must be made for training. Courses must be developed, time must be set aside to provide the training, skills must be assessed, and a budget allocated in order to develop workers' skills.

Information systems must be geared to providing reports based on work team performance. Management information systems must be geared to this approach, as well as planning and materials systems.

**Interdependency:** Work teams are not appropriate for every activity in the work place. The greater the degree of coordination and communication required among employees in order to accomplish the work, the more appropriate a work team organization is. Unless there is interdependency among the employees engaged in producing a product there is no need for work teams. For example, if a number of employees in a given area are producing longitudinals for use in fabrication and assembly where there is little interaction between employees, the team work approach is of minimal utility. However, if a group of sheetmetal fitters, pipefitters, electricians, and steel workers are responsible for outfitting a house unit or machinery space where a substantial amount of coordination and communication is necessary in order to have the job done most efficiently, a work team is likely to be very successful.

**Skill Levels:** The use of work teams presumes the availability of employees with the technical skills necessary in order to complete the job. If the work force is made up of a large percentage of trainees, a more traditional supervisor/work crew approach would be more appropriate in order to have an effective work force. Ideally, employees would possess the necessary interpersonal skills to operate successfully as members of a team. Willingness to participate in meetings, take feedback from co-workers, and exercise independent judgement where necessary, all would be helpful in producing a productive team member.

**Incentives:** Although neither work team in the NASSCO experiment received incentives for superior performance, this issue was a real one for employees involved. A good deal of time at the start of the Table 9 project was spent in diffusing this issue and making it clear that for this particular project no additional pay or promotions would be available regardless of their performance. Questions were raised by the group as to why they should not receive more if they were responsible for producing more, and most members felt that if they did become multi-skilled they should be recognized for it. The most common suggestion for recognition was being promoted to a higher classification. Although most employees were willing to participate in the projects without added incentives, a question exists as to whether or not continued high performance could be expected without some reward for those individuals responsible for it.

**Job Security:** Another issue that was of importance to both workers and supervisors alike was that of job security. As workers see themselves becoming more efficient, especially when multiple skills are involved, real fears are raised regarding whether they are working themselves out of a job. In order for the team approach to be successful, this issue must be dealt with. For supervision, this issue is even more real than for the production worker on the team. Taken to its logical end, work teams would operate without supervision, therefore, this level of management would cease to exist as it is currently constituted. Supervisors must be assured that there will be a place for them in the new organization, either as technical experts, planners, or team liaisons. Ideally, assurances would be given that layoffs would not take place as a result of a move to the new organization, but rather that absolute reduction in numbers would occur through attrition. Without these assurances, the transition to self-managing work teams will be made difficult by those who are still in a position to influence team operations.

**Union Involvement:** In order to have a truly participative work environment, attempts should be made to involve union representatives in the transition to a work team organization. By holding meetings with union representatives, before action is taken, ground rules can be established and concerns addressed before they become issues in the field. In most cases there are clear benefits for all parties involved in this method of organization, therefore resistance is less likely to occur. Union concerns must be dealt with openly and honestly, since if efforts are made to circumvent labor agreements, union representatives are fully capable of sabotaging any efforts to develop fully involved and committed employees.

**Third Party Involvement:** The use of an impartial third party to determine the organizational climate for work teams, determining an appropriate implementation plan, and serving as a go-between for management, the union, and employees is very important. At the outset of an organizational change effort, such as that involved in moving to a work team organization, the potential for mistrust and suspicion is great. A third party can do much to minimize these negative factors and keep the parties focused on the goal of the change.

A proper balance must be maintained between union and employee concerns, and management rights. A third party can help to provide this balance.

## CONCLUSION

NASSCO's experience with self managing, multi-skilled work teams has proven this method of organization can work in a shipyard using zone-construction methods.

In order for it to work, supervision must be well oriented and given some assurances of what their future role will be.

Workers must be trained in both the technical and social skills required to complete work in their area and operate as effective work team members.

The work group must be maintained in a more stable fashion than is usually found in a shipyard work environment.

In order for this to occur, work must be arranged such that teams are able to perform tasks requiring similar skills over time. Ideally the work being performed would require a substantial amount of communication and coordination of effort among the trades involved.

The organizational structure of the Production Department should be changed to an area or product orientation, rather than a trade organization and the management information systems, material, and planning systems must all be reoriented to the new organizational structure.

Management must be willing to treat employees as responsible individuals, share the information necessary for them to take ownership of their work and make informed decisions regarding it, and recognize and reward superior performance when it occurs.

For those who chose this method of organization, the road will not be an easy one. Many aspects of existing organizations will have to be changed, with all of the resistance that a major change effort implies. For those who choose this road the potential rewards are great. Substantial productivity improvements and increased employee satisfaction are possible. All that is required is a shared vision and many hard working and dedicated employees at all levels who are willing to give it a try.

#### **ACKNOWLEDGMENTS**

I would like to thank Lisa Lammens, Administrative Assistant, and Jerry Spiegel, Ph.D., Personnel Development Specialist, in the Personnel Programs Department of NASSCO for their efforts in taking care of all of the many details that must be attended to in order for a project such as this to work. Lisa was particularly important in providing the glue that held Table 9 together. She acted as a third party, as well as consultant, counselor, go-between and teacher as the project progressed. She was responsible for scheduling meetings, finalizing agendas, acting as liaison between the group and other functions of the shipyard and, occasionally, as a go-between between supervision on the table and employees assigned there. Thanks are also in order to Robert Hillstrom, General Foreman Fitting, for both his technical expertise and his willingness to take on supervisory responsibilities in a challenging new work force organization. All workers and supervisors on Table 9, and all members of the Blockbusters work team, are to be commended for their efforts in making this experiment a success. Despite the many uncertainties inherent in the approach attempted in this project, everyone worked together to do the best job they possibly could. Without active, involved workers, a project such as that attempted in this case would have had no chance for success.

Thanks are also in order for the union representatives from Shipmen's Local 627 of the International Association of Bridge, Structural and Ornamental Ironworkers; the International Association of Machinists, District Lodge 50 Local Lodge 389; International Brotherhood of Electrical Workers, Local 569; United Brotherhood of Carpenters, Shipwrights, Boatbuilders and Helpers, Local 1300; and Orange Belt District Council of Painters, No. 48, Local 333. These union representatives were willing to allow this experiment in a different method of work force organization to go on without interference. The results of this project indicate it was to the benefit of the employees they represent, as well as to NASSCO.



# APPENDIX A

TABLE 9/BLOCKBUSTERS SURVEY RESULTS			ALL CLASS. TOTAL	ALL CLASS. — 1ST	ALL CLASS. — 2ND	ALL SHIPFITTERS	SHIPFITTERS — 1ST	SHIPFITTERS — 2ND	ALL WELDERS	WELDERS — 1ST	WELDERS — 2ND	BLOCKBUSTERS
RANK	NO.	QUESTION										
1	5	The work team was a positive experience for me.	1.6	1.7	1.3	1.3	1.3	1.7	2.0	2.3	1.5	1.1
2	8	The work team concept did not meet all of its goals, but it is a better experience for me than the typical NASSCO work situation.	1.6	1.7	1.1	1.2	1.3	1.0	2.1	2.6	1.3	1.2
3	40	Working together as a team has increased motivation,, job awareness, and morale.	1.6	1.6	1.3	1.5	1.5	1.3	1.7	2.0	1.3	1.1
4	34	The project facilitators were helpful to the work team.	1.7	1.7	1.1	1.5	1.5	1.3	1.9	2.0	1.8	1.9
5	28	Getting more information about the work helped me do a better job.	1.7	1.5	1.9	1.7	1.5	2.7	1.7	1.7	1.8	1.3
6	17B	I could influence how I would do my job.	1.8	1.8	1.1	1.6	1.8	1.0	2.0	2.3	1.5	1.2
7	41	Work team members were able to function at a higher level of independence than the average NASSCO worker.	1.8	2.0	1.4	1.3	1.3	1.3	2.5	3.0	1.5	1.1
8	2	Membership in the work team was more stable than other areas in NASSCO production.	1.9	2.0	1.7	1.2	1.3	1.0	2.7	3.3	1.8	1.2
9	13	The team could have functioned better, or just as well with less supervisor direction and more worker responsibility.	1.9	1.8	2.7	2.9	3.2	2.0	3.1	3.0	1.9	1.2
10	1	The work team met for one hour per week for training and problem solving.	1.9	2.0	1.7	1.7	1.8	1.3	2.2	2.3	2.0	1.9
11	3B	I improved my skills in fitting.	1.9	1.8	2.0	1.5	1.4	2.0	2.4	2.6	2.0	1.9
12	21	The work team (in spite of its shortcomings) is a positive idea and should be tried elsewhere at NASSCO.	1.9	2.2	1.1	1.7	1.9	1.0	2.1	2.6	1.3	1.0
13	3C	I improved my skills in blueprint reading.	1.9	2.0	2.0	1.5	3.0	1.7	2.5	2.9	1.8	2.1
14	39	I would rather choose to be a work team member again rather than be assigned to a more typical NASSCO work area.	1.9	2.2	1.3	1.6	1.8	1.0	2.1	2.9	1.5	1.2
15	29	The work team helped improve my communications, problem identification and problem solving techniques.	2.0	1.7	1.9	1.7	1.7	1.7	2.4	2.6	2.0	1.2
16	3D	I improved my skills in burning.	2.0	1.9	2.3	1.9	1.7	3.0	2.1	2.3	1.8	2.6
17	38	I had more flexibility in carrying out my job than the average NASSCO production employee.	2.0	2.1	1.7	1.6	1.7	2.0	2.5	2.9	2.0	1.1
18	3E	I improved my skills in rigging.	2.0	1.9	2.4	1.5	1.5	1.3	2.8	2.6	3.3	2.6

- 1 = STRONGLY AGREE  
2 = AGREE  
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5 = STRONGLY DISAGREE

TABLE 9/BLOCKBUSTERS SURVEY RESULTS  
Page 1

TABLE 9/BLOCKBUSTERS SURVEY RESULTS			ALL CLASS. TOTAL	ALL CLASS. — 1ST	ALL CLASS. — 2ND	ALL SHIPFITTERS	SHIPFITTERS — 1ST	SHIPFITTERS — 2ND	ALL WELDERS	WELDERS — 1ST	WELDERS — 2ND	BLOCKBUSTERS
RANK	NO.	QUESTION										
19	9	I have become more skilled in locating and solving work problems.	2.0	2.1	2.1	1.5	1.4	1.7	2.8	2.3	3.1	1.6
20	15	I was given more information about the work than is usual at NASSCO.	2.0	2.0	2.3	1.7	1.5	2.7	2.5	2.7	2.0	1.9
21	37	Work team members were able to take more self direction in their work than the typical NASSCO production employee.	2.0	2.1	1.9	1.6	1.7	1.3	2.6	2.9	2.3	1.3
22	3A	I improved my skills in welding.	2.1	2.0	2.3	2.2	3.3	1.9	1.9	3.3	1.8	2.0
23	27	I was given opportunities to practice my multi-skills on the job.	2.1	2.1	1.9	2.1	2.3	1.7	2.4	2.7	1.8	1.6
24	33	The work team had good communication among the members.	2.2	2.1	2.4	1.5	2.1	2.7	2.1	2.3	2.0	2.5
25	30	I was able to locate, solve, and carry out solutions to work problems in an independent manner.	2.2	2.2	2.3	1.5	1.3	1.6	3.2	3.0	3.1	1.0
26	31	Work goals were set by supervision.	2.2	2.3	2.0	2.1	2.7	1.9	2.4	1.5	2.9	—
27	32	The work team project fulfilled its objective to help employees become multi-skilled.	2.2	2.3	2.0	2.1	1.9	2.7	2.4	1.5	2.9	—
28	42	The work team was usually clear as to who was in charge.	2.2	2.2	2.3	1.5	2.0	2.2	2.3	2.5	2.1	2.0
29	14	I have a better understanding of the budgeting and planning process that affects our work area because of the work team.	2.2	2.1	2.7	2.3	2.7	2.2	2.2	2.5	2.0	1.7
30	22	The team usually had start-up meetings at the beginning of the shift.	2.2	2.3	2.0	2.1	1.3	2.3	2.4	2.5	2.3	1.2
31	26	I received both positive and corrective feedback on my production.	2.2	2.3	2.0	2.1	1.7	2.3	2.4	2.7	1.8	1.7
32	36	I was able to do more planning and scheduling of my work than people in other NASSCO production areas.	2.3	2.3	1.7	1.8	1.0	1.8	2.9	2.5	3.1	1.5
33	3F	I improved my skills in layout.	2.3	1.8	3.7	1.6	3.0	1.3	3.3	4.3	2.7	2.0
34	7	I usually received blueprints and stage plan work instructions.	2.3	2.3	2.4	1.8	2.4	1.7	3.0	2.5	3.3	3.1
35	11	I was seldom asked to work out of my work team area.	2.4	2.5	2.0	2.4	2.7	1.3	2.3	2.1	2.5	1.7
36	35A	Non-team members (planners, engineers, etc...) could be called on for help if needed by the team during meetings.	2.4	2.8	2.1	2.2	2.1	2.7	2.6	3.0	1.8	2.1
37	18	I was given opportunities to develop multi-skills through classroom and on-the-job training.	2.4	2.3	2.6	2.1	1.9	2.7	2.7	2.9	2.5	1.7

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TABLE 9/BLOCKBUSTERS SURVEY RESULTS

TABLE 9/BLOCKBUSTERS SURVEY RESULTS			ALL CLASS. TOTAL	ALL CLASS. — 1ST	ALL CLASS. — 2ND	ALL SHIPFITTERS	SHIPFITTERS — 1ST	SHIPFITTERS — 2ND	ALL WELDERS	WELDERS — 1ST	WELDERS — 2ND	BLOCKBUSTERS
RANK	NO.	QUESTION										
38	19	The work team reduced waiting time between trades.	2.4	2.5	2.1	1.9	1.8	2.3	3.0	3.6	2.0	1.2
39	16	My supervisor was usually supportive.	2.4	2.4	2.4	2.2	2.1	2.7	2.7	3.0	2.3	—
40	17A	I could influence how the team would work.	2.4	2.4	2.3	2.1	2.2	1.7	2.9	3.0	2.8	1.6
41	25	Man-to-man turnover helped the communication between the shifts.	2.5	2.6	2.1	2.4	4.1	1.0	3.4	2.4	3.0	—
42	3G	I improved my skills in scheduling.	2.5	2.4	2.9	2.2	2.0	3.0	3.0	3.1	2.8	1.6
43	23	I was more free to choose how I completed the job assigned to me than other production areas at NASSCO.	2.5	2.8	1.9	2.4	2.6	1.7	2.7	3.1	2.0	1.1
44	17C	I could influence subject for training.	2.6	2.4	3.0	2.5	2.3	3.3	2.6	2.6	2.8	2.0
45	35B	Non-team members (planners, engineers, etc...) could be called on for help if needed by the team during production.	2.6	2.5	3.0	2.3	1.8	4.0	3.0	3.6	2.3	2.0
46	10	Man-to-man shift turnover took place.	2.9	3.0	2.7	3.9	3.2	2.0	2.8	2.6	1.9	—
47	6	The first and second shifts operated like one team.	2.9	3.0	2.7	2.6	2.4	3.3	3.4	4.0	2.3	—
48	12	Work goals were set by the team.	3.0	3.1	2.7	2.9	3.2	2.0	3.1	3.0	1.9	1.2
49	24	My supervisor was more of a consultant/teacher than a boss.	3.0	3.0	3.1	2.7	2.8	2.7	3.4	3.3	3.5	—
50	20	Although supervisors changed, there was one supervisor clearly in charge of Table 9.	3.2	2.7	4.4	2.8	2.4	4.3	3.8	3.4	4.5	—
51	4	The work team had very little or no conflict between supervisors.	3.5	3.2	4.4	3.5	3.3	4.7	3.6	3.1	4.3	—

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TABLE 9/BLOCKBUSTERS SURVEY RESULTS

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## APPENDIX B

### MEMORANDUM OF UNDERSTANDING WORK ASSIGNMENTS

#### All Classifications

1. Employees in any classification may perform minor touch-up painting by either brush or spray can (as appropriate) of surfaces which have been worked, disturbed or damaged as a result of the employees job performance.
2. Any employee in any classification with proper training and supervision may use and install chain falls or other such rigging devices as may be required to perform minor rigging work in connection with their regular work. This work shall be limited to weights of approximately 300 pounds and shall not involve the lateral transfer of loads via the yard and stay method.
3. Employees working in the sub-assembly area, under the direct supervision of a supervisor, who has been trained and Company certified for the modification, and removal of handrails and toe boards on units under construction in sub-assembly, may perform such work when directed. Such work when required will be performed in accordance with applicable safety regulations.
4. Any employee in any classification may be assigned to make minor modifications to protective covers for machinery or equipment upon which they are working.
5. Employees in the Shipbuilder classification may at the discretion of supervisors, perform shipfitting, any type of welding burning, installation of sheetmetal parts, wire ways and will also install electrical connection boxes, and do any layout work required.
6. A new classification of Pipe Welder will be established. Employees so classified may perform pipe welding and burning and may assist a Pipefitter in performing pipefitting work, as directed by the supervisor. It is also understood and agreed that any Pipefitter may be assigned to perform welding, tacking, and burning as required. An approximate ratio of 1 Pipe Welder to each 2.5 Pipefitters will not be exceeded in either classification. For the purpose of computing the ratio of 1 Pipe Welder to each 2.5 Pipefitters, any employee classified as an Outfitter who as previously been classified as a Pipefitter will be included with the Pipefitter classification.

An approximate ratio of 1 Pipe Welder to each 2.5 Pipefitters will be maintained.

In recognition that the 2.5 to 1 ratio has been adopted in order to develop equitable sharing of work between Pipefitters and Pipe Welders on an historical relationship and recognizing the goal of a 2.5 to 1 ratio the following is agreed to:

- 1) The Company will provide the Union with an accounting of hours on a monthly basis to assist in maintaining a 2.5 to 1 ratio in each quarter.
- 2) This list will be analyzed by the Company as to the maintenance of the ratio and what plans, if any, the Company has to make adjustments to correct any imbalance.
- 3) The analysis may be the subject of discussion between Company representatives and Union representatives upon request.

#### WORK ASSIGNMENTS

1. Pipefitters may at the direction of the supervisor perform the work functions listed below in addition to their regular duties as a Pipefitter:
  - 1) Tack welding, welding (that which does not require pipe certification) or burning associated with the fitting of pipe.
  - 2) Tack welding, welding and burning involved with the installation of hangers.
  - 3) Tack welding, welding and burning required for pipe penetrations. An approximate ratio of 1 Pipe Welder to each 2.5 Pipefitters will be maintained.
2. A new classification of Outfitter will be established. Employees assigned to this classification may, at the discretion of the supervisor, perform any work regularly performed by Outside Machinists, Boiler Machinists and Pipefitters. Employees so classified may do such tack welding, welding, burning, (does not include pipe welding) layout and grinding as is necessary in the performance of their work assignments. Such work assignments will also be made in accordance with the employee's skill level.
3. Outside Machinists and Boiler Machinists may at the discretion of the supervisors be assigned to perform the work functions listed below:
  - 1) Incidental welding or burning involved with the installation, removal or repair of any machinery or equipment of the type generally removed, repaired or installed by these classifications.
  - 2) Disconnection of any pipe required in removing any machinery or equipment.
  - 3) Removal of any type of interference or obstruction where such interference or obstruction limits or hampers in any way the removal or installation of any machinery or equipment. This shall not include disconnection of electrical wires, electrical equipment, or structural interferences.
4. Electricians may at the discretion of supervisors perform welding, tack welding, burning, and grinding required in connection with their work.

#### SHEETMETAL DEPARTMENT

- A. Sheetmetal Fitters may perform burning and any welding permitted by the tack welding test.
- B. The Sheetmetal Department will not change its present pay practices.
- C. Item number one above does not alter the Company's rights under the provisions of Section 10, Subsection D.
- D. Sheetmetal Fitters who have not been given the opportunity to train in welding and burning or those who are unable to learn the skills required or have a physical disability that prevents them from learning those skills will not be laid off, disciplined, or discharged, due to their inability to perform such work.

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Documentation Center  
The University of Michigan  
Transportation Research Institute  
Marine Systems Division  
2901 Baxter Road  
Ann Arbor, MI 48109-2150

Phone: 734-763-2465  
Fax: 734-763-4862  
E-mail: [Doc.Center@umich.edu](mailto:Doc.Center@umich.edu)